St. Louis. Division of Health

A COURSE IN ENVIRONMENTAL SANITATION FOR CIVILIAN DEFENSE SANITATION WORKERS

Presented by the

HEALTH DIVISION
Department of Public Welfare
City of St. Louis, Mo.

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INSTRUCTIONS TO VOLUNTEERS FOR ENVIRONMENTAL SANITATION WORK DURING EMERGENCIES

No more important task will arise during an emergency than safeguarding the health of the great masses of people in our densely populated areas. Such duties in the health field are serious work and demand definite qualifications of the personnel administering them. This course is designed to aid you, as a volunteer for health work in emergencies, in preparing yourself for efficient and useful service.

Enumerated here are three points which must be thoroughly understood and observed at all times as guides for responsibility and general conduct:

1. Since the ultimate issues involved in health work are life and death, the volunteer must ever be punctual and dependable; the welfare of people should be a fundamental interest and an incentive to diligent effort.

2. The volunteer in health work must have good health, tact and sympathy, dignity, a respect for authority, personal integrity and the ability to keep confidences. He should set a good example and "practice what he preaches."

3. Ideas and suggestions for change are often valuable. The volunteer, however, should discuss these points only with the person in charge and only after his assigned task has been carried out. Always bear in mind - destructive criticism destroys morale and accomplishes nothing. Constructive criticism made in good spirit and through proper channels strengthens purpose and organization.

In case there is a desire on anyone's part to acquaint himself further with the subjects dealt with in this course or to supplement the necessarily brief discussions with outside preparation or study, the following texts, which are available as indicated, are suggested:

An Introduction to Public Health. Mustard, Harry S. The Macmillan Company, New York, 1935. (2)

Essentials of Field Sanitation, 1935 (1)
Medical Field Service School
Carlisle Barracks, Pa.

Military Preventive Medicine. Dunham, George C. (1)
Army Medical Bulletin No. 23, 1938
Medical Field Service School
Carlisle Barracks, Pa.

Pathogenic Micro-Organisms. Park and Williams (1)
Lea & Febiger, Philadelphia, 1933.

Preventive Medicine and Hygiene. Rosenau, M. J. (1)
D. Appleton - Century Company, New York, 1935.

Textbook of Bacteriology. Burdon, K. L. (1)
Macmillan Company, New York, 1938.

Public Health Administration in the U. S. Smillie, W. G. (1)
The Macmillan Company, New York.

Air Raid Defense. Wachtel, Kurt. (2)

Civil Air Defense. Prentiss, A. M. (1)
Whittlesey House, London
McGraw Hill Book Co., Inc., New York, 1941.

Boy Scouts of America
Public Health Merit Badge Pamphlet (1)

Municipal and Rural Sanitation. Ehlers and Steel (1)
McGraw Hill Book Company, Inc., New York, 1937.

Man, Microbe and Malady. Drew, John. (1)

The above books are available as follows:

(1) In the library of the Sanitary Section, Health Division, City of St. Louis. To obtain use of these references, contact Mrs. Lucy De Backer, librarian, Room 62 Municipal Courts Bldg. When it is necessary to take one of the volumes out of the library it must not be taken from the Sanitary Section before 5:00 P.M. and must be returned by 9:00 A.M. of the following day.

(2) In the St. Louis Public Library.

FIRST LECTURE OUTLINE

ENVIRONMENTAL SANITATION IN CIVILIAN DEFENSE

I Purpose of Course:- To extend knowledge of environmental sanitation generally, and to train emergency personnel (volunteer and full-time) who may be called upon to participate in, and in some cases, direct extension of normal health work and sanitation functions in times of emergency. Such emergencies may come about by air attack, extensive sabotage, epidemics, fire, flood, earthquake or tornado.

II Special instructions to volunteer workers in health departments were distributed.

III A properly organized health department is prepared to meet emergency needs. The St. Louis City Charter provides for extensive powers for the Health Commissioner in time of emergency.

IV The Health Division in time of war emergency would have the assistance and cooperation of both the city administration and of the civilian defense organization, as well as many community agencies.

V The organization plan of the city government was given and special emphasis was placed on the organization of the Health Division.

VI The Civilian Defense Organization was given with emphasis on the organization of the Medical Services function.

VII Inter-relationships between county, state and national organizations were discussed.

VIII Types of health problems which may confront the Health Division in emergencies:

1. Normal problems continued.
2. Normal problems accentuated.
   - (a) Increased wastes, greater needs due to increased population.
   - (b) Use of sub-standard housing.
     Poorer sanitation.
     Over crowding-contacts transfer germs.
   - (c) Influx of population with low immunity.
   - (d) Influx and transfer of persons with communicable diseases.
   - (e) Shortage of important preventive materials (chlorine, rubber, paper).
   - (f) Scarcity of materials and foods - inflation; resulting in adulteration and nutrition problems.
   - (g) Scarcity of physicians, dentists, nurses, technicians.
   - (h) Lowering of moral standards, concentration of males:- venereal diseases.
   - (i) Increased production - longer hours of work - occupational diseases and industrial accidents
   - (j) Mental Tension
     Disruption of families
     War excitement
     Production fatigue

3. Sabotage of vital supplies, utilities and services.
   (a) Destruction
   (b) Poisoning - bacterial and chemical
   (c) Delay and obstruction methods

4. Air attack of vital supplies, utilities and services.
   (a) Bombing
   (b) Incendiaries
   (c) Gassing
   (d) Bacterial warfare

IX Some diseases whose control may be affected:

1. Respiratory diseases
   Pneumonia
   Tuberculosis
   Colds
   Influenza

2. Childhood diseases
   Diphtheria
   Scarlet fever
   Other highly contagious diseases

3. Venereal diseases
   Gonorrhea
   Syphilis
   Chanchroid

4. Water-borne diseases
   Typhoid fever
   Cholera
   Dysentery (amoebic and bacillary)

5. Insect-borne diseases
   Malaria
   Plague
   Typhus fever

6. Food poisonings

7. Occupational diseases

8. Accidents

Session No. 2

Public Water Supplies

Some facts about water

Water is most vital substance necessary for man's existence.
Animal and plant life planned with water as a basis.
Man may live for weeks without food but only a few days without water.
The human body is about 70% water.
Plant life varies in water content from 50% to 75%.

Sources of water supply

Rain - the purest water occurring in nature.
Surface - rivers, lakes, ponds, etc.
Ground - the source for wells, springs, etc.
Course of water from purity to impurity.
Descends as rain
Flows through and over the earth dissolving gases, minerals, organic matter, bacteria.
Waters were unpolluted with pathogenic (disease producing) organisms before man became populous.
Man's excreta in water dangerous.
In most cases does not effect appearance, taste, odor.
Man has therefore caused and spread many of his own diseases by polluting his water supplies.

Water-borne diseases

Typhoid
Paratyphoid
Dysentery
Cholera
Tapo and hook worm
Anthrax, tuberculosis and poliomyelitis are thought by some authorities to be water-borne.

Manner in which water-borne disease outbreaks or epidemics are caused
By Consumption of:
1. Polluted, untreated raw water.
2. Inadequately treated water - surface and ground.
3. Contamination of stored water - accidental or wilful.
4. Contamination of water distribution systems through:
   Cross connections
   Back-siphonage
   Repairs without sterilization
   Separate fire supplies
5. Contamination of source by improper location or construction especially of wells furnishing untreated water. (This is the greatest cause).

Principal uses of water

Fire supply
Drinking
Washing
Sewage disposal
Boiler water
Condensation of refrigerants

Water may contain
- Dissolved gases
- Solid material - dissolved and suspended
- Living organisms
  - Bacteria - pathogenic and otherwise
  - Plant life - algae, fungi
  - Animal life - protozoa (amoeba)
  - Crustacea - shrimp, clams, oysters, etc.
  - Sponge life
  - Fish

Purification - is necessary to render water safe and satisfactory for man's uses.
- May be accomplished by:
  - Passage through soil
  - Storage
  - Action of air and sunshine
  - Treatment (coagulation, filtration)
  - Sterilization

- Text for purity - B. Coli test
  - Will indicate presence of contamination of fecal origin.
  - Will indicate whether water was treated sufficiently or properly.
  - It is always on the safe side since B. Coli can survive treatment that will kill pathogenic organisms.

Why a public water supply?

- More practical
- More economical
- More uniform
- Most important - is vastly safer and is the only way in which water-borne diseases can be controlled adequately.

Sources of water for a public supply
- Wells, lakes, rivers - treatment of each type will depend upon the character and nature of the individual supply.

A typical water plant
- Water pumped from river to sedimentation basin - copper sulfate may be added to control algae.
- Chemical treatment or coagulation - thorough mixing and short retention.
- Filtration
  - Slow sand filters (few in U. S. A.) - filter 2 - 3 million gallons per acre per day.
  - Rapid sand filters - filter up to 150 million gallons per acre per day.

Disinfection accomplished:
1. By adding chlorine either liquid or dry.
2. By adding chloramines

   In both 1. and 2. a chlorine residual is necessary as an indication that disinfection has been adequate and complete. This residual for public water supplies is generally maintained at 0.2 p.p.m. available chlorine. This also serves as a safety factor by allowing a slight excess of the disinfecting chemical to remain to react with any disease producing organisms which might possibly get into the water after it leaves the treatment plant.
3. Action of ozone (not used in U. S.)
4. Action of ultra violet light (not used in U. S. in any large plant).

Aeration at various points
To eliminate tastes, odors, gases, etc.

The St. Louis water supply system.
Chain of Rocks purification plant.
Source of supply - Mississippi River.
Treated water storage reservoir - at Compton Hill, Grand & Russell Aves.
40 rapid sand filters.
Howard Bend purification plant.
Source of supply - Missouri River.
Treated water storage reservoir - at Stacy Park, St. Louis County.
20 rapid sand filters.
Pumping stations
Chain of Rocks plant.
Baden Station
Bissell's Point Station
Howard Bend plant
Sanitarium station

Statistics from 1941 report of Water Commissioner.
45,980 million gallons of water treated for year.
126 million gallons per day average.
154 gallons per capita per day.
Treatment of the water for this year saved $649,211 in soap alone for the St. Louis population which is more than the cost of purifying the water.

Factors upon which public water supplies depend.
Source of water - intake, pumps.
Source of power - electricity, coal, oil.
Chemicals for treatment and disinfection.
Pumping stations.
Distribution systems.

Protecting normal water supplies from sabotage, air raids, etc. and precautions to be observed.
Of primary importance is an effective understanding of the problem and the points at which sabotage might be directed. Then through proper organization, preparation, and protection, sabotage may be anticipated and prevented.

To prevent serious damage and disruption of water supply by bombing of distribution system.
1. Water mains should never be laid together.
2. Auxiliary pumps and sources of power should be provided.
3. Reserve supply of pipe, pumps, replacement parts should be kept on hand.

Repair of bomb damage.
After repairs are made, the main in the vicinity of the break and all new material installed must be disinfected by filling the pipe with water containing 50 - 100 p.p.m. available chlorine. This must be allowed to stand for 3 hours and at the end of that time must contain at least 5 p.p.m. available chlorine or treatment must be repeated.

Protecting vital plant installations.

1. Power supply, pumps, chlorinator should receive special attention and protection.
2. Portable chlorinators should be kept on hand.
3. Plant should be fenced and grounds properly lighted at night.
4. Watchmen should be present at all times.
5. Provision should be made for blackout of plant and grounds in case of air raid.
6. Reserve supplies of treatment and disinfecting chemicals should be maintained.
7. All plant personnel should be carefully investigated and no persons but these allowed on or in vicinity of premises.
8. Camouflage where possible.

Protecting pumping stations.

1. Reinforcement against bombing.
2. Maintaining a reserve of replacement parts.
3. Camouflage.

Protecting distribution systems.

1. Maps and charts in hands of proper parties showing valves, shut-offs, distribution lines, to prevent serious waste in case of breaks and to help in locating breaks, etc.
2. Proper crews to:
   a. Remove debris from mains.
   b. Repair breaks.
   c. Sterilize repairs quickly.
3. Camouflage.

Storage tanks and reservoirs should be guarded.
Emergency fire supplies should be guarded (none in St. Louis)
Mobile water treatment units should be provided to serve areas where supply is completely knocked out.

Proper laboratory control must be set up.

Necessary to prove contamination or pollution with:

1. Pathogenic organisms.
2. War gases.
3. Compounds of the heavy metals.
4. Extremely toxic chemicals (cyanides, phenols).
5. Glucosides.
6. Alkaloids (nicotine, strychnine, etc.).

All of these harmful substances can be detected quickly by proper sampling and laboratory analyses.

Sessions No. 3 and 4

Emergency Water Supplies

Emergency or supplementary supplies.
- Springs (none of consequence within city - would be quite unsafe).
- Wells (A few within city - breweries. Any shallow well would be dangerous).
  - Dug well (water can be chlorinated in an emergency).
  - Drilled well) Best type of construction.
  - Driven well)
- Cisterns (can be chlorinated).

ALL EMERGENCY SUPPLIES, NO MATTER WHAT THE SOURCE, MUST BE STERILIZED BEFORE BEING USED FOR HUMAN CONSUMPTION.

ALL UNSAFE SUPPLIES MUST BE PLACARDED.
WHERE PLACARDING IS IMPOSSIBLE, ADD DYE TO WATER.

Emergency connections.
- Intermain connections.
- Cross connected municipal supplies.
  - City and county.) Examples.
  - City and East St. Louis)

Storage for emergency supplies.
- Water tanks in buildings.
  - Stored supply.
  - Pressure booster tanks.
  - Fire supplies (none in city)
- Fire storage basins (none in city)
- Cisterns
- Swimming pools
- Wading pools
- Ponds and lakes
- Mississippi River

Emergency disinfection.
- Dosed to contain 10 p.p.m. available chlorine (Cl_2)
  - Residual Cl_2 must be 1 p.p.m. available Cl_2 (distinct odor and taste) after 1/2 hour. If not, treatment must be repeated (i. e. dosed to 10 p.p.m. again.)
    - This residual to be checked by orthotolidin comparator.
- Boiling for at least 5 minutes.
- Adding 1-2 drops of 7% tincture of iodine per qt. - allow to stand 1/2 hour.

Danger of overchlorination.
- Gives extremely disagreeable odor and taste to water.
- No danger from poisoning.
- People may refuse to drink and seek unsafe supply.

Distribution of emergency supply.
- All vessels and containers for this use must be aired, washed, scrubbed, etc. according to previous use and then sterilized with solution containing 100 p.p.m. available Cl_2.

- R. R. tank cars and tenders.
- Water tank trucks (street sprinklers, etc.).
- Milk trucks.
- Gasoline trucks (Britain).
- Water tank carts - either 110 or 300 gals. (army).

Tanks placed in trucks - 500 gals. (Britain).
Water bags (army).
Milk cans.
5 and 10 gal. jugs and jars.

TO BE ON SAFE SIDE, EMERGENCY SUPPLIES READY FOR DISTRIBUTION SHOULD CONTAIN 3 p.p.m. AVAILABLE Cl_2 AS IT LEAVES THE DISTRIBUTION POINT TO TAKE CARE OF STORAGE, DEMAND OF WATER, AERATION, POSSIBLE CONTAMINATION, ETC.

Mobile water puricication plants (army).
Mobile chlorinating units.
(an adequate number here in city).

Laboratory check on emergency supplies.
Residual Cl_2 test before distribution.
Residual Cl_2 on stored supplies twice a day.
Sampling for bacteriological examination on stored supplies daily.
Sampling for residual Cl_2 and bacteriological examination at random daily on smaller distributing containers.
Proper method of sampling of extreme importance.

Actual distribution of water.
Personnel to be carefully trained.
Careful handling by personnel.
Advise public.
Radio
Handbills
Newspapers
Loud speakers on water trucks
Warn against wasting.
Used water to be saved for flushing toilets.

Available Cl_2 - the amount of Cl_2 in a disinfecting compound that is actually free for disinfecting purposes.

Compounds to be considered here for disinfection (as examples)
Clorox (solution) stock - 49,000 p.p.m. available Cl_2.
B. K. powder (50% available Cl_2) made up according to directions makes stock solution of 35,000 p.p.m. available Cl_2.
HTH-15 (15% available Cl_2).
Bleach (sample at hand contains 24% available Cl_2.

Calculations for making stock solutions.

Clorox and Purex already in Form of stock solution.

Basis for calculations is % available Cl_2 given on label of container. Will not always be accurate because of deterioration - depending on compound and type of container used for it.

Bleach - to make stock solution of 30,000 p.p.m.

24% available Cl_2
12 oz. package = 3/4# = .75#
.75# x 24% = .18# Cl_2
1# Cl_2 per 1,000,000# H_2O = 1 p.p.m. available Cl_2
.18# Cl_2 per 1,000,000 x .18 or 180,000# H_2O = 1 p.p.m. available Cl_2
We want 30,000 p.p.m. available Cl_2, however.

$$\frac{180,000}{30,000} = 6\#\ H_2O \text{ for } 30,000 \text{ p.p.m. stock solution.}$$

$$\frac{6\#\ H_2O}{8.3\ \#/\text{gal.}} = .72 \text{ gals. water} = \underline{3 \text{ qts.}} = \text{Answer.}$$

Examples:

1. Square tank. 10' x 10' x 6'
Calculate capacity and dose to 10 p.p.m. with 30,000 p.p.m. stock solution.

$10 \times 10 \times 6 = 600$ cubic feet H_2O

$600 \times 7.5 = 4500$ gallons water

Volume of stock solution (in gals.) x 30,000 = 4500 x 10

Volume of stock = $\frac{4500 \times 10}{30,000}$ = 1.5 gallons = Answer

2. Round tank. 8' high, 31.4 feet in circumference
Calculate capacity and dose to 10 p.p.m. with 35,000 p.p.m. stock solution.

Diameter = $\frac{\text{circumference}}{\pi}$ = $\frac{31.4}{3.14}$ = 10'

Volume = .79 x 10 x 10 x 8 = 632 cubic feet

632 x 7.5 = 4,730 gallons

Volume of stock (in gals.) x 35,000 = 4,730 x 10

Volume of stock = $\frac{4,730 \times 10}{35,000}$ = 1.35 gals. = 1 gal. 1qt. 13 oz. = Answer

3. Dose 10 gallons water to 10 p.p.m. with 30,000 p.p.m. stock solution.

Volume of stock x 30,000 = 10 x 10

Volume of stock = $\frac{10 \times 10}{30,000}$ = .0033 gallons

.0033 x 128 (oz. per gal.) = .42 oz. = Answer

CONVERSION UNITS

Weight
16 oz. = 1#

Liquid measure
16 oz. = 1 pt.
32 oz. = 2 pts. = 1 qt.
128 oz. = 8 pts. = 4 qts. = 1 gal.

Water weighs 62.5# per cubic foot
1 cu. ft. water contains 7.5 gals.
1 gal. water weighs 8.3#

Area of circle = $\pi \frac{d^2}{4}$ = $.79d^2$ = .79 x d x d

Volume of cylinder = $.79d^2$ x Length or Height

Diameter of circle = $\frac{\text{Perimeter}}{3.14}$

Volume of rectangular container = Length x Width x Depth

% (percent) = parts per 100 5% = 5 parts per 100 or $\frac{5}{100}$

p.p.m. = parts per million 5 p.p.m. = 5 parts per 1,000,000 or $\frac{5}{1,000,000}$.

p.p.m. = % x $\frac{1,000,000}{100}$ = % x 10,000

example: 5% = $\frac{5}{100}$ x 1,000,000 = 5 x 10,000 = 50,000 p.p.m.

example: 3.5% x 10,000 = 35,000 p.p.m.
example: .3% x 10,000 = 3,000 p.p.m.

Clorox = 49,000 p.p.m. available Cl_2

B. K. stock solution made according to directions = 35,000 p.p.m. available Cl_2

Water to be sterilized for drinking:

To be dosed so as to contain 10 p.p.m. Cl_2

Residual to be at least 1 p.p.m. after 1/2 hour

Results to be checked with orthotolidin comparator

Plumbing-Session No. 5

I Hazards of faulty plumbing fixtures and plumbing connections.

A. Definition of terms:
1. Vacuum - a negative pressure.
2. Cross connection - a connection between a safe and an unsafe water supply.
3. Submerged inlet - a water inlet below the maximum possible water level.
4. Maximum water level in a fixture - lowest point in the rim of the fixture, not the over flow opening seen in the side.

B. Common defective fixtures found:
1. Lavatories and bath tubs having submerged inlets.
2. Toilets - direct flushing and water tank.
3. Drinking fountains having submerged inlets.
4. Laundry and dish washing machines having submerged inlets and direct sewer connections.
5. Hospital and dental equipment.
6. Frost proof toilets - whether or not the valve drains into the sewer or the ground surrounding the sewer.
7. Improper installations of:
a) traps
b) vents

II Conditions causing drop in pressure or vacuum in water pipes.

A. Outside of building.
1. Broken mains.
2. Fires.
3. Shutting off a portion of the main.
4. Pumps in industrial plants and in large buildings.

B. Inside of building.
1. Pipe size toosmall.
2. Improper tee connections.
3. Shutting off for repairs.
4. Water hammer.
5. Heating water tank above 212°F. and then cooling.

III Cross connections.

A. Private wells and cisterns.
B. Fire protection supplies.
C. Methods of correction.
1. Break connection.
2. Purify private supply.
3. Gate and check valves are not sufficient.

IV Methods of protecting individual fixtures.

A. Breaking physical connection between safe and unsafe supplies.
B. Raising water inlets to obtain definite air gaps - 1" on lavatories, 2" on bath tubs.
C. Install vacuum breakers.
1. Flush toilets.
2. Water tank toilets.

V. The part played by sanitary plumging in National Defense.

A. Man must have an adequate supply of safe water.
B. Source of water must be satisfactory.
C. Proper design and installation of plumbing assists in keeping safe water safe.

Sewage

Definition - Water carried discharges of the human body together with the liquid wastes from the household and factory plus any leakage into the system (separate system) - all of the above plus rain water and rain water washings (combined system).

St. Louis sewage is from a combined sewerage system.

Composition -

Residential sewage - wastes from bathroom, laundry, and kitchen.
Manufacturing community sewage - wastes from bathroom, laundry, kitchen, and industry.
Sewage from combined system - wastes from bathroom, laundry, kitchen, and industry, together with rain water and rain water washings (sand, oil, and refuse on streets).

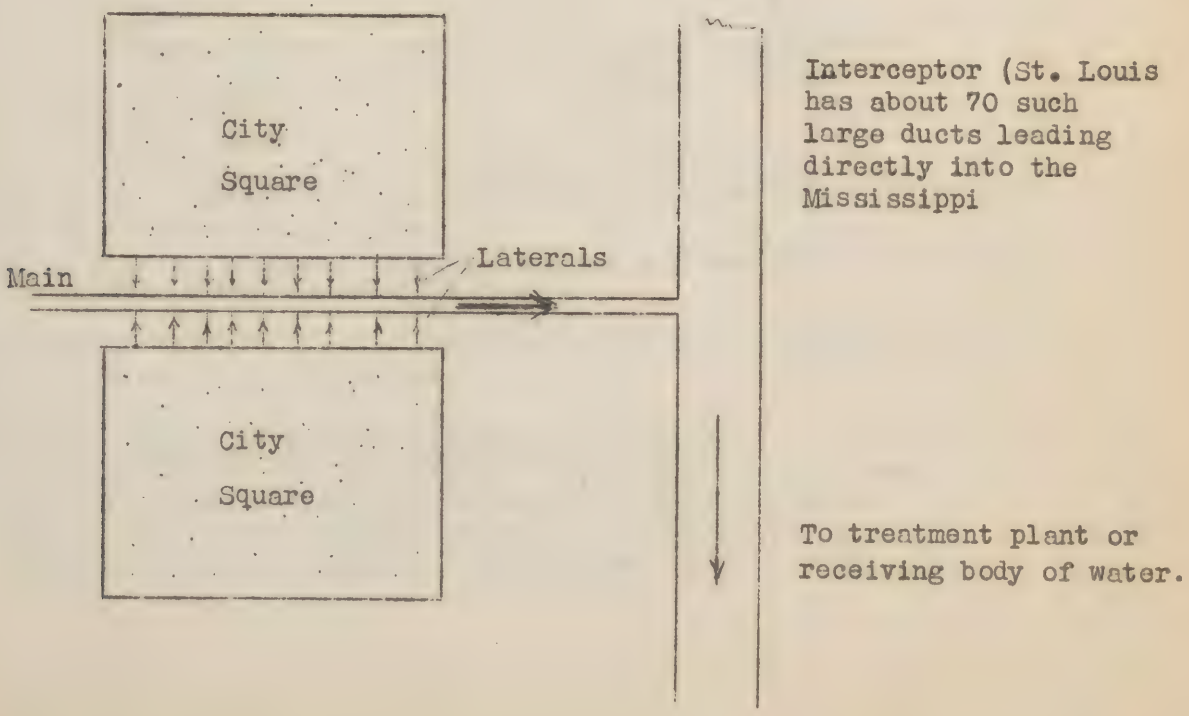
Sewage from all three categories contains more than 99.9% water. The solids - soap, grease, dirt, grit, paper, feces, garbage, bacteria, chemicals, - are less than 0.1% by weight.

Volume - varies with hour, day, season, and type of industries in community.
50 gallons per person per day in a residential city.
100 gallons per person per day in a manufacturing city.
200 gallons per person per day in a combined system.

Sewerage

Definition - System of pipes arranged for carrying off the sewage of a community plus any equipment used to treat this sewage.

Sewage Collection



Type of sewage treatment plant is dependent on:

1. Concentration of sewage.
2. Volume.
3. Flow of receiving body of water.

The degree of treatment of sewage must result in a product, which when dumped into a receiving body of water, is of no menace to health and does not give off offensive odors.

Methods of Treatment

1. Dilution of raw sewage.
2. Sedimentation.
3. Chemical treatment.
4. Filtering and oxidation devices.
   a) Intermittent sand filters.
   b) Contact beds.
   c) Trickling filters.
5. Activated sludge process.

Public Health Significance

Basically because of pathogenic organisms contained in human excretions and waste products.

1. Typhoid fever.
2. Cholera.
3. Dysentery.
4. Hookworm.
5. Other intestinal diseases.
6. Ear, eye, nose, throat infections.
7. Skin infections.
8. Poliomyelitis (infantile paralysis).

Possibility of poisonous contamination of water from chemical wastes (very remote) - - cyanides.

Possible Points of Pollution

1. Animals that have access to sewage and food.
   a) flies
   b) roaches
   c) rats
2. Seafoods that are consumed raw or cooked improperly.
   a) shell fish - oysters, clams, shrimp, mussels
   b) cat fish
   c) carp, sunperch
3. Bodies of water used for bathing or swimming.
4. Home food supplies when cellars or homes are flooded because of broken sewage mains.
5. Private and public water supplies - Therefore, protection of drinking water is so important.

   Odor by itself is of doubtful public health menace, but it is indicative of pollution.

Illustration of Danger of Improper Disposal of Sewage

In solid feces - typhoid bacteria live from 10 to 15 days.
In solid feces - dysentery bacteria live about 8 days.
In dry pit privy - typhoid bacteria live about 10 days.
In wet pit privy - typhoid bacteria live from 15 to 30 days.

Statistics from Nottingham, England show typhoid cases in
2.7% of homes having privies
0.83% of homes having pail closets
0.18% of homes having sewer connections

Stockport, England statistics show typhoid cases in
3.4% of homes having privies
1.2% of homes having sewer connections

showing that sewage must be disposed of in such a way that minimizes human or animal (fly, etc.) contact with sewage.

Breakdown of Sewerage System

Sabotage or Aerial Bombardment

Results in:

1. Greater danger of seepage into water mains.
2. Flooding of streets, cellars, buildings.
3. Interruption of toilet facilities.
4. Possible increase of fly and rat borne diseases.
5. Washing out and undermining of water conduits.

Operation During Repair:

1. Channel thru crater to carry flow.
2. Shutting off the flow at the next upstream manhole and pumping out sewer.
3. Percolation of sewage into soil.
4. Emergency pipe lines overground.

Disposal During Repair:

1. Burying in trenches.
2. Privies.
3. Pail closets.
4. Chemical privies.
5. Septic tanks - for certain factories.

General Care.

1. Disinfect surfaces exposed to sewage or flood water with chloride of lime (one pound to 8 gallons of water) or cresol (4 teaspoons per gallon of water).
2. Clean out cellars and disinfect.
3. Flooded furniture
   a) curtains - if possible, boil fabrics
      - dry thoroughly in sunshine
      - press with hot iron
   b) rugs - flush with clear water on floor
      - dry in sunshine
      - mild soap and warm water
      - rinse and dry
   c) clothes - boil
      - hot pressing
4. Foodstuffs
   a) discard all but water tight containers, in which case sterilize outside with hot water.
   b) no flooded foodstuffs to be sold to the public
   c) IF IN DOUBT, PLAY SAFE
5. Wells - disinfect with chlorine and then test bacteriologically.

6. Emergency Workers
   a) should not place hands near mouth, eyes, or nose.
   b) should not handle food.
   c) should take typhoid shots.

Session No. 7

Garbage and Refuse Collection and Disposal.

Materials which must be disposed of:

Garbage - solid and semi-solid wastes from preparation of foods; also includes rejected or condemned food.
Sources - homes, hotels, institutions, restaurants, groceries, markets, slaughtering and packing plants.
Varies considerably according to season of year.
Watermelon and cantaloupe rinds increase both bulk and water content of summer garbage.

Ashes - waste products from the combustion of fuel.
Varies greatly in amount according to both locality and type of fuel used.

Rubbish - household and business wastes not either garbage or ashes. Most generally paper, cans, wood, containers.

Dead animals and fowls.
Manure and street sweepings.

Disposal of above materials involves

1. Collection
2. Transportation
3. Disposal

Public health significance of garbage and rubbish disposal.

Garbage and rubbish in themselves are not likely to cause disease. Where these materials are allowed to accumulate or are disposed of improperly, they offer breeding places and harborage for rats, flies and mosquitoes which do have public health significance. It is only through the proper collection and disposal of garbage and refuse that rats, flies and mosquitoes can be thoroughly controlled. Is also necessary for control of objectionable odors and nuisances.

Considerations for collection of waste materials.

1. Method of collection is determined by method of disposal to be used.
2. If to be disposed of by:
   a. Animal feeding - must have no glass, metal or rubbish mixed in.
   b. Incineration - may be wrapped and contain material which will burn.
   c. Reduction and recovery - must contain garbage alone.
   d. Burial - may contain anything.
   e. Grinding and disposal into sewers - should not contain materials harmful to grinder.
   f. Dumping - helps to have ashes and garbage mixed.
3. Proper container necessary - leak proof, non-absorbent, with tight fitting cover.
4. Proper placing for collection.
5. Educating public - tagging cans; refusing to collect.
6. Proper handling of cans to prevent spillage and damage to can; replacing covers.
7. Proper time for collection.
8. Proper frequency of collection.
9. Municipal versus contract system.

Transportation of collected material.

Means of collection and equipment to be used.

Methods of disposal.

Dumping of garbage and/or rubbish - advantages and disadvantages
Into body of water; on land.
Sanitary fill for garbage.
Burial trenches and plowing under of garbage
Should be oiled to control maggots (flies).
Disposal by hog feeding - should be cooked. Danger of trichinosis to humans.
Disposal by incineration.
Location of incinerator
Incinerator design.
Closed type - only one which will produce necessary temperature (1250° - 1400°F.) to destroy odorous gases.
Semi-closed type.
The above two types are much the best of any but require very close supervision of operation.
Open incinerators (emergency or temporary).
Rock pile incinerator.
Multiple shelf incinerator.
Drying pan incinerator.
Barrel and trench incinerator.
Rock pit incinerator.
All above have serious disadvantages.

Disposal by rendering.
For grease and oil.
For tankage.
For fertilizer.

Rubbish sorting, salvaging, scavenging.
Advantages - economic.
Disadvantage - may cause disease in those performing, difficult of supervision and control.

Dumping.
Control of odors, burning, rats, flies, dust, blowing papers, is important.
Scavenging should be prohibited or rigorously regulated. (caretaker)

Disposal of kitchen waste and liquid garbage.
To sewers if possible.
To soakage pits - similar to urine pits.
Grease traps always necessary.
Pail or can type.
Barrel or tub type.
Baffle trap type.
To soakage trenches.
Grease traps again necessary.
Precautions for better functioning.
Rest periods of week or so for pits or trenches.
Alternate use of pits or trenches.
10% hypochlorite solution to control organic growths.

Bath water disposal
To sewers if possible.
To soakage pits or trenches with grease traps.

If St. Louis disposal and collection facilities were bombed or destroyed:

Rubbish could be allowed to accumulate for some time.
This happens anyway in St. Louis where rubbish is not municipally collected.
Such a practice adds considerably to the problem of controlling rats.

Garbage could be buried.
In back yards if possible
Outside city.

Dumping in open must be prevented.
All efforts possible should be devoted to the control of rats, flies and other vermin.

Insect-borne Diseases Session No. 8

Insect-borne diseases include the most deadly and highly contagious known to man. These diseases are placed in two general classes according to the way in which they are transmitted.

Mechanically - in which the disease producing organisms are merely transferred from one place to another by the insect. The fly carrying typhoid germs on his feet is an example.

Biologically - in which the disease producing organisms must pass through a biological cycle or growth in the body of the insect before it can be passed to another host. The mosquito spreading malaria through its bite is an example.

Fly-borne diseases

1. Sleeping sickness of Africa - biologically by Tsetse fly - usually fatal.
2. Typhoid fever, cholera, dysentery - ordinary flies - mechanically.
3. Tularemia - infection is usually mechanical by mechanical transmission from infected rabbit to man during slaughtering but can be spread also:
    a. Mechanically by deer flies
    b. Mechanically by wood ticks and dog ticks

Tick-borne diseases

1. Tularemia
2. Rocky mountain spotted fever - mechanically transmitted. Virus survives from generation to generation in ticks.
3. Relapsing fever - transmitted mechanically through insect feces getting into wound.

Mite-borne diseases

1. Japanese river fever - transmitted by bite of mites.

Body lice-borne diseases

1. Trench fever - transmitted biologically - given to man through louse feces in wound.
2. Epidemic typhus fever - transmitted mechanically - louse feces in wound.

Flea-borne diseases (rat fleas)

1. Endemic typhus fever - transmitted mechanically - flea feces in wound.
2. Bubonic plague - disease of rats and rodents - transmitted by bite of certain fleas.
3. Pneumonic plague - may develop out of bubonic plague in winter. More apt to develop out of squirrel-borne plague. Resembles severe penumonia and is spread from man to man after it develops.

Mosquito-borne diseases

1. Malaria - transmitted biologically by certain species of anopheles mosquito.
2. Yellow fever - transmitted biologically by Aedes egypti mosquito.
3. Dengue fever - transmitted biologically by Aedes egypti mosquito.
4. Filariasis - transmitted by another species of the Aedes mosquito and by a species of the Culex mosquito

Control of insect-borne diseases

Many of the necessary conditions, transmitting agents or sources of infection are not now present in this area. This eliminates a number of these diseases from local consideration except for special matters concerning movement of population, transfer of infecting or transmitting agent or possible sabotage efforts.

Some of the diseases mentioned are practically unknown in this area and

conditions may be such as to prevent any chance of outbreak. An example of this is yellow fever which has never been shown to be transmitted by mosquitoes of this area, so that an epidemic of yellow fever is a very remote possibility.

Control of flies
- Elimination of breeding places
  - Manure piles
  - Exposed garbage
  - Other decomposing organic matter
- Elimination of food supply
  - Material as under breeding places above
  - Exposed food for human consumption
- Keeping flies out
  - Screening
  - Air blasts
- Trapping
  - Fly traps
  - Fly paper
- Killing
  - Insect sprays
  - Swatting
  - Electric screens

Control of lice - head lice, body lice, pubic lice (crabs)
- Delousing
  - Removal and disinfection of infested clothing.
  - Shaving of all body hair is best way of getting rid of lice; or thorough washing with kerosene, lead-free gasoline, or vinegar followed by strong soap and water.
  - Fumigation or chemical treatment may be used to sterilize garments, bedding, etc.

Control of mosquitoes
- Elimination of breeding places
  - Draining and ditching of watery areas
  - Filling in of such areas
  - Oiling of still water
  - Household control of empty cans, barrels, guttering, catch basins, etc.
- Poisoning of larvae
  - Oiling and dusting of breeding water
- Control by fish
  - The Gambusia top-water minnow eats mosquito larvae
- Screening
  - Of all dwelling places - mosquitoes to be kept out
  - Mosquitoes should particularly be kept away from those individuals infected with malaria to prevent spread of the disease.

HEALTH DIVISION
DEPARTMENT OF PUBLIC WELFARE
CITY OF ST.LOUIS, MO.

Bulletin F-8

RAT CONTROL[1]

Rats are a potential public health problem. While the Health Division has no statistics to indicate that the rats of this city are acting to transmit disease at this time, it is possible under certain circumstances that rats may act in such a manner.

Certain unusual fevers are transmitted by rats. Typhus fever and bubonic plague are carried by rat fleas. The rat is also a reservoir for the parasite which causes trichinosis, a disease contracted by man by eating insufficiently-cooked pork which is infected with the parasite. The rat is a factor in the spread of infectious jaundice, and has also been accused of having a part in some typhoid fever and some food poisoning outbreaks.

The destruction of property by rats is exceedingly great. Even if rats had no public health significance, their destructive power would justify active measures of suppression. Rats destroy flowers, laces, silks, carpets, eat fruits, vegetables, and meat, destroy by pollution ten times as much as they eat; they may cause fires, gnaw lead pipe and floors, damage foundations, doors, and piers. In short, they are the worst animal pest that lives among us.

And it does live among us. The rat has lived in close proximity to humans as long as we know. He has moved with us in our migrations throughout the world and has been our constant companion. As civilization progressed, the rat learned the ways of man and adapted himself to changing conditions. At this time, the rat's adaptation to our abode is almost perfect.

It has been said that no other animal in the world lives with less justification. The rat breeds, lives and feeds its family, always at the expense of man and other animals. Rats comprise more than one-third of the earth's population of mammals, thus being the largest single species. Perhaps at one time, the rat served a useful purpose as a scavenger, but today, no justification can be found for him. Peculiarly, the rat is one of our worst enemies and at the same time, he remains as our guest.

The complete extermination of the rat is hopeless. It seems a biological impossibility. The rat is too cunning and he is exceedingly cautious. Millions of rats have been killed in India, Japan and in San Francisco during the plague control measures, but little appreciable impression was made on the millions remaining.

In the well-built residential sections of a city with concrete walks, asphalt streets, and good garbage and rubbish disposal, there are few rats. Such exclusion of rats involves primarily the proper construction, repair, and upkeep of buildings and keeping the premises in a sanitary condition. This is the secret of rat control and it is the only method by which rats can be continuously controlled.

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[1] This Bulletin has been prepared by John Buxell, Chief Engineer, Sanitary and Food Control Sections of the St. Louis Health Division.

Since we cannot hope to exterminate the rat, the best that can be done in a city like St. Louis is to suppress the rat, reduce his numbers and thus control his harmfulness and destructiveness. Even this is a gigantic task and will not be the result of sporadic campaigns but only the result of continuous, cooperative, and intelligently-applied control measures. Cooperative effort in a given effort is more likely to succeed; individual effort may not be as successful but is well-worth doing where rat infestation is great.

In order to organize and apply rat control measures, it is well to know the habits of rats.

RAT HABITS:

Rats are nocturnal animals. They prefer to travel and look for food at night. They have defective vision in the daylight but by using their whiskers as feelers, they can move very rapidly along walls, or in pipes. They prefer narrow, out-of-the way places. Since they usually follow one path between their nest and their source of food, it is possible to detect their runs. Rats are great travelers and will migrate in large numbers. This is especially true where food and shelter are scarce. Seasonal migrations have been noted in many large cities.

Rats require both food and shelter for their well-being and they cannot and will not persist where either of these elements are lacking. If rat infestation is great, the cause can usually be traced to some condition favorable to the animals. This is usually food and shelter. If this condition is removed, their presence is discouraged and the result is a reduction of rat population, of harmfulness, and of destructiveness.

RAT CONTROL IN GENERAL:

Because the rat is cunning and cautious, it is difficult to control him. The problem is usually one of outwitting the rat and planning and executing the measures effectively and thoroughly.

The individual confronted with a problem of rat control, should plan his campaign carefully. He should provide for his own efforts at destruction and prevention. He should enlist the cooperation and active assistance of his neighbors and friends. And first and foremost, he must remember that destruction methods are not permanently effective; preventive methods are the only ones that will control the rat and do it permanently.

Rat-proofing of buildings, removal of rat harborages, cutting off the rat's food supply, poisoning, trapping, fumigation, and a few miscellaneous methods are the methods of rat control. The first three are the permanent methods, the last four are the temporary ones.

RAT PREVENTION

RAT-PROOFING:

This is a measure of first importance. Most modern buildings and many older ones may be rat-proof or could be made so at small cost. Wherever it can be and most effective means of rat riddance.

The first step in rat-proofing a building with brick, stone, or concrete foundation is to search thoroughly for all places in the structure where rats might enter, especially for small openings around pipes and for small cracks due to careless workmanship or settling. Where the foundation is hidden by porches or adjoining structures, should be a place of suspicion. Rats may enter through drain pipes, doors, basement windows, through sewers, through broken foundations and other open-

ings. These must be closed to him. Where possible, openings should be closed with metal sheeting or with concrete. Large openings or windows may be covered with strong and durable screenings. Ventilators and sewer openings should be provided with gratings and doors likely to be left open at night should be equipped with self-closing devices.

Food handling establishments which are not rat-proof afford a large supply of food for the rat and as a result are unusually heavily infested with rats. The managements of such establishments suffer a heavy economic loss. Extreme care and thoroughness should be employed in rat-proofing such establishments.

Buildings with rat-proof foundations should be elevated 18 inches or more and kept open on all sides and free from all accumulations beneath.

Consultation and advice on rat-proofing is available from the Sanitary Section of the Health Division, when specific problems are to be solved.

REMOVAL OF SHELTER:

A fine way to secure rat riddance is to remove all favorable rat harbors or shelters. A rat will not remain where safe and comfortable shelter is not available. The most common rat harbors are dead spaces within double walls and beneath floors. Other common rat shelters are those provided by stored produce and supplies lumber and scrap piles and accumulation of trash and refuse. Rubbish should be disposed of promptly. Municipal collection of rubbish is a very important factor in rat control. The elimination of uncontrolled dumping of rubbish is important. Licensing and regulation of rubbish or refuse dumps and collectors by city ordinance is a possible answer, since municipal collection may not be feasible at this time.

Thorough cleanliness and orderliness both inside and outside of buildings will deter the rat from finding shelter. Closing of rat burrows is important.

CUTTING OFF THE RAT'S FOOD SUPPLY:

Well-fed rats multiply exceedingly rapidly. On the other hand, hunger limits the number of rats by mutual destruction and by rendering poisoning and trapping more effective. If the rat is not fed, he will move to more favorable quarters.

Foodstuffs must be stored in rat-proof buildings, room, or containers. Refuse and garbage must be disposed of in tightly-covered receptacles. An open, improperly covered, or loosely covered garbage can, garbage disposed of in ashpits and on rubbish heaps are means of increasing the rat infestation of an area or neighborhood. Be sure that you are not feeding the rats in your area. Be sure that your neighbors are not feeding the rats. Call this to their attention. You will be doing yourself and them a service. Make sure that son Johnnie or daughter Ann is not throwing the garbage in the ashpit rather than going to the trouble of walking a few more steps to a slightly less convenient garbage can.

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These first three methods of rat control are especially effective in preventing rat infestation. Don't allow the rat to enter and find shelter, destroy his shelter if he has already found it and don't feed him. The methods that follow even if applied thoroughly and intelligently can have no permanence without the use of the methods that went before.

RAT DESTRUCTION

POISONING:

This can be a most efficient method of rat destruction. The chief objections to poisons are the danger to humans and to domestic animals and the possibility that the rats may die in inaccessible places where their decomposing bodies may cause obnoxious odors. A mild poison usually answers both of these objections. The

all-important requirement of successful poisoning is to set out baits that rats will eat. Usually it is almost as difficult to get rats to take unpoisoned baits as those that are poisoned. Barium carbonate and red squill are recommended types of poisons for rats but those should be used with caution and according to the specific directions which follow.

Success in poisoning depends largely upon the baits used and the methods of mixing and distributing them.

Barium Carbonate (precipitated) is a heavy, white, mineral salt, mildly poisonous to humans, tasteless, odorless, slow in action and inexpensive. All of these characteristics contribute to its value as a rat poison. When properly used it is highly effective and dependable for killing rats and is therefore recommended above all other poisons wherever it can be used with safety. The only serious objection to it is that it cannot be distributed freely without endangering other animals. Although it is comparatively mild and far less dangerous than most of the poisons commonly used in commercial rat baits, it is nevertheless fatal to chickens, dogs, cats and larger animals if eaten in sufficient quantity.

Kind of Baits. A variety of baits used separately gives the rat a choice of foods and increases the changes of the bait being taken. One kind of each of the following classes of food mixed separately with barium carbonate is recommended:

Cereals, such as bread, corn meal or rolled oats.
Meats, such as hamburger, steak, sausage, sardines or eggs.
Fruits and vegetables, such as apples, melons and tomatoes.

Baits should be fresh and of good quality. Fresh kitchen scraps or garbage can be worked into the bait to advantage. Scraps and hard food should be run through a chopper to facilitate mixing with the poison.

How to Prepare Baits. The powdered barium carbonate should be thoroughly worked into the soft cereals or ground food with the hands or with a spoon in the proportion of 1 part to 4 parts of the selected food. Add water if necessary to make the baits moist. A bait of the consistency of soft mush seems most acceptable to rats.

How to Distribute Baits. A teaspoonful of the prepared mixture is a sufficient quantity for the average rat baits. Put the baits in places frequented by rats, if possible, where they have been observed to feed. A convenient and successful method of exposing baits is to wrap teaspoonful quantities in small squares of newspaper or place them in small paper sacks and to close them by twisting the tops. When a variety of baits are used, wrap each kind separately and expose one of each kind in groups, or in sequence to give the rats a choice. In public places, baits should always be wrapped and the packages labeled POISON but it would be better in such instances to use red squill.

It is important that a sufficient number of baits be distributed at one time to provide an ample supply for every rat on the premises otherwise the resulting mortality will arouse the suspicion of the rats that are unharmed and will render subsequent baiting less successful. It is much better to prepare an excess of poisoned bait than not enough.

Baits should be distributed in the evening, so they will be fresh when the rats are feeding. Uneaten baits should be picked up the following morning and destroyed. Stale baits are unattractive to rats.

If the poisoning has been carefully carried out, a high mortality may be expected. It often happens that the destruction of a large portion of the rats on the premises results in frightening the remaining few away, so that moderately successful poisoning may result in a rather complete cleanup. Should the poisoning operation not be wholly successful, it is well to wait two weeks or more before re-

peating with other baits, or with other poisons or traps.

Pre-baiting. In stubborn cases, or when one is willing to go to additional trouble to increase the chance of success, pre-baiting is recommended. This consists of exposing fresh, unpoisoned baits, prepared exactly as the poisoned baits will be later on. If these are taken freely the first night, poisoned baits should be substituted after an interval of one or two nights. Otherwise clean baits should be exposed at two or three days' intervals (picked up in each case the following morning), until any suspicion the rats may have, has been overcome and they take the baits without hesitation. When this occurs, they will doubtless take the poisoned baits, the next night, and then the result should be a rather successful poisoning of the rats.

Caution. Barium carbonate is a relatively mild poison, but the danger from accidents must be emphasized. Keep it out of the reach of children (your own and others) and irresponsible persons, and away from domestic animals and fowl.

Antidote. Give an emetic consisting of either mustard or salt dissolved in warm water, or induce vomiting by inserting the finger in the back of the throat. Follow vomiting with a liberal dose of epsom or glauber salts.

Red Squill is a perennial bulb that grows wild along the coast of the Mediterranean Sea. Red squill is a rat poison but is relatively harmless to human beings and domestic animals. Its taste is highly objectionable to most animals and it acts as an emetic when taken in dangerous quantities. Rats, however, take it readily and do not vomit, so that red squill approaches the unique position of being a poison specific to rats. Red squill is therefore of particular value where the use of more poisonous products would be inadvisable.

Red squill is marketed in both liquid and powdered form, and either one is effective. The powder, as a rule, is more toxic to rats, less expensive and keeps better. It mixes readily with a wide variety of baits.

The directions which accompany red squill products should serve as a guide in using it, and especially in proportioning it in baits.

The directions given before for barium carbonate poisoning can be followed here in a general way, but prebaiting is highly advisable when using red squill. Because of the taste, rats generally will not eat baits with red squill a second time

Other Poisons. Other very effective rat poisons, usually much more poisonous than barium carbonate and red squill are available at many dealers under various trade names. Their names and addresses can be secured from the Telephone Directory under the classifications "Pest Control Service" and "Pest Control Products." Because of their toxicity, they should be used with extreme caution and strictly according to directions.

FUMIGATION:

The fumigation of rat burrows and of rat harbors is simple and effective under certain circumstances. Fumigation in a congested city like St. Louis is not permitted except by licensed fumigators. They can be found as described above under "Other Poisons."

One method of fumigation which is limited in its use but is comparatively safe and very effective is the use of exhaust gases from an automobile. This should not be used for buildings or under buildings, but for rat burrows under ashpits, under paving, etc., can be used with safety. A hose or pipe is attached to the car exhaust pipe and the exhaust gases introduced into the rat burrow. The poisonous carbon monoxide in the exhaust gases kills the rats. Precautions should be observed with this method, to be sure that the operator himself does not get a harmful amount of the gases. Even this method is against the law in St. Louis.

TRAPPING:

Trapping can be as effective as poisoning, is safer and is a good means of destruction of rats. The trapping campaign must be carried out by experienced persons; care must be exercised in maintaining, baiting and placing the traps. For home use, traps are generally used as a suppressive measure and permanent results can not be expected.

The simplest traps are likely to be the most effective. Again in trapping, the abilities and habits of the rat are of prime consideration. Traps must be clean and in good working order. If traps carry food odors due to past usage, the rat will probably not approach them. Traps should be placed in the known runways of the rat, along walls, on top of beams, and in the rat's path.

Traps can be used with or without bait. A rectangular piece of cardboard placed on the trigger of a snap trap is often effective. The rat in scampering around steps on the cardboard and springs the trap. The trap should be tied by wire or cord to a heavy or permanently fixed object. Baits for traps as for poisoning must be in variety, fresh and appeal to the rat. Bread and doughnuts, if fresh, may be used. Raw or cooked meats, bacon, fish, apple, melon, tomato, carrot and nut meats are recommended. Cheese while good for mice is not as effective for rats. Almost any food suitable for human consumption is likely to appeal to the appetite of the rat. Bait should be ample in size and tied to the trigger. The trap should be lightly set. The danger of a strong rat trap to the human hand should be remembered.

NATURAL ENEMIES:

A good rat dog (small terriers) are of use if they are born- or natural ratters. Not all dogs are ratters. Cats that are of real value as ratters are rare and if so, are usually destructive to bird life. When confined to warehouses, produce depts and similar places, good cats are sometimes of value.

COMMUNITY COOPERATION:

Although suppressing rats is largely an individual problem, rat infestation has a serious effect on the whole community and organized control effort is highly desirable. The Health Division of the City of St. Louis is happy to be of assistance in furnishing detailed information on the various control measures outlined in this pamphlet. Copies of this pamphlet and specific advice on your problem of rat infestation can be obtained by telephoning Main 5560, Station 264 or 687, or by addressing a request to the Health Division, 64 Municipal Courts Bldg., St. Louis, Mo.

It is suggested that rodent control offers a very worthwhile field for civic organizations, service clubs, women's clubs and even individuals to exercise their best energies, initiative, and leadership. The organization of cooperative neighborhood efforts at rodent control, the education of the public in proper sanitation, the passage of laws on rubbish and refuse disposal, licensing and control of dumping, and requirement of rat-proof construction, all require such leadership.

Sanitation of Food Session No. 9

Food poison - any agent or material present in food which causes illness when taken into the digestive system. (Sensitivity to certain foods (food allergy) should not be confused with food poisoning.)

Types of food poisoning and their transmission

Bacterial poisons

1. Typhoid bacilli - cause typhoid fever. Usually transmitted by infected water, milk and shellfish.
2. Salmonella - cause paratyphoid fever. Usually transmitted by vegetable salads, milk products, custards, fish, egg products.
3. Streptococci - cause streptococcus or "strep" infections (septic sore throat). Usually transmitted by raw milk.
4. Staphylococci - cause staphylococcus infections. Usually transmitted by creamed foods, cream filled baker's products, and salads.
5. Brucella - cause undulant fever (Malta fever). Transmitted by raw milk.
6. Tubercle bacilli - cause tuberculosis. Transmitted by meat and milk.
7. Clostridium - the toxin produced by this bacteria causes the severe poisoning known as botulism. It occurs most often in improperly canned foods. Occurs in Europe from eating improperly preserved sausages and meats. (The sickness resulting from this poisoning and also from others of the above group have in the past been improperly called "ptomaine poisoning."
8. Dysentery bacilli - cause the very severe bacillary type of dysentery. Usually results from eating food which has been improperly handled by persons who harbor or carry the bacillus in their bodies.

Virus infections

1. Poliomyelitis (infantile paralysis) has been traced to milk and perhaps other foods.

Parasitic infestations

1. Trichina - a tiny round worm, found in pork, which causes trichinosis. Usually transmitted by improperly cooked or raw pork.
2. Tape worm - do not cause a disease but tend to produce extreme weakness and anemia. Transmitted by infected beef, pork and fish.
3. Amoeba - cause the severe amoebic dysentery and amoebic colitis. Transmitted usually by carriers as in case of bacillary dysentery.

Poisonous plants

1. Mushrooms - certain types, eaten mistakenly, are quite deadly.
2. Certain berries and vegetables - when eaten mistakenly or in excess produce severe symptoms.

Chemical poisons - those most usually encountered

1. Lead and arsenic - from fruit that has been sprayed and not washed; also from accidentally eating the spray compound.
2. Cadmium - from preparing or storing food in cadmium plated ware.
3. Cyanides and fluorides in insect powders - from using such a product mistakenly for a food product (flour, baking powder, powdered sugar).

Control of food.

Meat and milk - thorough inspections of source, animals, slaughtering, pasteurization and processing plants with all necessary laboratory control.

Food establishments - thorough inspection and regulation of premises, equipment and personnel.

Educational methods directed to food handlers and food consumers

Foods which have been allowed to stand for some time after cooking particularly if they are not cooled and kept refrigerated, are likely to cause food infections. Foods which have been allowed to stand for some time should be recooked, especially canned and green vegetables. Food infection is the most important of the food-poisonings which confront the industry since it is the most likely to occur frequently and with mass infection.

The introduction of the harmful bacteria which cause food infection and those which cause epidemics occur in practically the same manner and are discussed as one problem.

1. Improperly washed vegetables. Unless all portions are separated and scrubbed, particles of filth containing bacteria may remain. It should be realized that fertilizer is used and possibly sewage or heavily contaminated water may have been used for irrigation when the vegetables were growing in the fields. Cooking offsets the effect of the bacteria, but when eaten raw in salads there is no protection, unless thoroughly washed.

2. Contamination of foods by employees who are carriers of disease.

   A cook or any other individual engaged in the making of salads, dressings, sandwiches or pastries may contaminate these foods with his hands. Such people should not work in the food-handling industry.

3. Contamination of foods by any employee due to unclean hands after visiting toilet. Proper washing of the hands after such visits is absolutely essential.

4. Contamination of foods by rats, flies, and roaches. Screening usually provides sufficient protection from flies, and food should be properly stored at night to prevent contamination by rats and roaches. This applies to flour, meal, sugar, etc., as well as the finished products.

5. Contamination of foods, especially pastries by cook with infected arm, fingers, etc. Boils, furuncles, and sores containing pus are teeming with bacteria which multiply like wildfire in such foods as salad dressing, cream and meringue pies, eclairs, and cream puffs.

6. Contamination of food by customer. Pies, doughnuts, etc., should be protected so customer cannot cough or sneeze on them, or so that they cannot be handled. Sugar should not be in a bowl, where it can be contaminated by saliva on the customer's spoon. Food which has been served to the customer has been breathed upon, and probably sneezed upon even though it has not been touched. If the customer is talking, the food has been thoroughly sprayed with

saliva, since droplets are scattered for several feet by everyone while talking. The food should not be served to another customer.

7. Contamination of foods by waiter or waitress. It goes without saying that food should not be sneezed upon. If at all possible, while suffering from colds, the flu, etc., one should not work, but rest in bed for the safety of fellow employees as well as the patrons. Food should be handled by the hands as little as possible.

8. Improper use of hand towel. If the hand towel is to be used to wipe or handle hot dishes, it should not be used to wipe the lips, the neck, or arms. A towel used to wipe the counter or tables should be used exclusively for that purpose.

9. Contamination of sandwich preparation table. Dirty plates and other utensils should not be placed on this board. Towels used to wipe tables and counters should not be used to wipe this table. The table should be free of cracks and have a top of impervious material.

10. Contamination of refrigerator. The refrigerator should be thoroughly cleansed and sterilized weekly. No spoiled foods should be kept here. The refrigerator should drain through a trap. This is to prevent the entrance of cockroaches and rats and sewer gases.

11. Contamination of food by sewage. If there are any overhead sewage drainage pipes, they should not be over the kitchen range, work tables, refrigerator, or any place where unprotected food is stored. If so, sheet metal drip pans should be suspended under the pipes to conduct condensation drippings and sewage drippings at the joints to a point of safety. No unprotected foods should rest on the floor where it would be subject to contamination from toilet bowl overflow or any other flooding. Sugar, salt, and flour in cloth sacks should never be placed on the floor even temporarily. Food should not be stored in the toilet or dressing room under any circumstances.

12. Contamination of drinking water. If there are any floors above your food handling establishment, you should have an inspection made by the City Sanitary Engineer of the water piping and plumbing installations. There are certain plumbing fixtures and piping arranagements which might permit sewage or contaminated water to be siphoned into your drinking water supply. Common defects in connection with food handling establishments are refrigerator compression cooling units directly connected to sewers, air-conditioning cooling tower make-up water incorrectly supplied, submerged inlets to potato peelers, and warming tables.

13. Use of uninspected meats. The City Health Department maintains inspectors at all slaughter houses except those under Federal inspection. All meats killed or processed should bear identifying marks indicating the plant and the fact that it was inspected. Only these meats should be used by food handling establishments unless from properly inspected plants in other cities. No meat should be used which has been slaughtered under a shade tree in somebody's pasture. A high percentage of all animals are diseased in some portion, and only the trained veterinarian is in position to determine how much of the meat can be used and how much discarded. Sausage should not be bought from peddlers unless it bears a permit number issued by the Health Department.

14. Adequate cooking of foods. All pork meats should be thoroughly cooked; raw and rare prok should be avoided. Masses of food like spaghetti should be stirred thoroughly so that cooking will be complete to the center of the mass.

15. Uninspected or ungraded milk should not be used. Only the use of Grade A Pasteurized Milk is authorized. Occasionally individuals will attempt to sell surplus milk from uninspected sources; the use of such milk is a distinct hazard. One of the worst effects from the use of such milk is undulant fever.

16. Improper storage and dispensing of milk. Milk bottles, chocolate milk, and orange drinks should not be stored in ice boxes so that water covers the top. Milk should be served in individual half-pint bottles with cap left on so the customer can see the grade of the milk and the name of the dairy; the glass should not be inverted on the top of the bottle. Milk pumps are outlawed; milk in less than half-pint amounts for drinks should be pured as needed from quart bottles and should not be dipped from a can. Coffee cream served in little tumblers are filled from bottle at one time, they should be stored in refrigerator. Capping of these tumblers is undesirable, since capping by hands is an insanitary procedure unless the person doing it disinfects his hands and does nothing else until the capping is completed. During peak hours when it may be necessary to stack several trays of these tumblers, a sheet of tissue paper may be placed between a tray and the tumblers under it to avoid contaminating the open tumblers.

17. Improper handling of pies and other pastries with cream filling. All cream and meringue pies, eclairs, and cream puffs should be refrigerated or used within a few hours after preparation. They should not be placed in sunny window show-cases. In some sections of the country, bakeries no longer handle eclairs and cream puffs, but sell the shells for the consumer to fill himself with freshly made filling. No custards, puddings, whips, or meringues should be made for sale between June 1 and September 15 unless they are consumed within one hour or immediately cooled to below 50°F. and are kept at this temperature until used,

18, Improper handling of commercially prepared sandwiches. All wrapped sandwiches should bear the date prepared and should be collected by the distributor daily, Sandwiches containing filler that requires refrigeration should not be used.

19, Improper use of cracked ice. Ice ground out in the street in a grinder attached to the tailboard of an ice truck is not fit to put in coca-cola, iced tea or any other drinks. This type of ice should only be used for refrigeration purposes, since it has been exposed to street dust and other forms of contamination, Ice for these drinks should be rinsed off with clean tap water and then chipped or ground in the establishments where used, Ice for this purpose taken from wet boxes should be thoroughly rinsed, since the water in most boxes becomes filthy from labels, glue, and dirt.

Salvage of gas contaminated foods

It is not necessary to destroy all food which has been exposed to a war gas attack,

1. Food contaminated with respiratory gases such as chlorine or phosgene

can be reclaimed by ventilation or aeration and heating although a disagreeable taste may remain.

2. Food contaminated with vesicant (skin burning) gases or liquids (mustard gas, lewisite, etc.) should be destroyed with very careful handling to protect handler.

Protecting food against gas

1. Foods in air tight bottles and cans are well protected.

2. Waxed cardboard, cellophane and oil skin covered containers offer good protection. (Ordinary paper and cloth bags afford no protection at all).

3. Foods which cannot be protected by gas proof packaging such as fresh meats and vegetables should be stored in gas-proofed store-houses.

4. Places where food is prepared for consumption should be made as gas tight as possible and kept closed during gas attacks.

Sanitation of Milk Session No. 9

I Milk is the perfect food - for humans and bacteria.

A. Two types of bacteria found in milk
1. Helpful bacteria - used as cultures in making cheese, etc.
2. Pathogenic bacteria - disease producing.

B. Two sources of disease germs in milk
1. Directly from cow - undulent fever, septic sore throat, tuberculosis.
2. Manual contamination - diphtheria, typhoid fever, dysentery, etc.

C. Pasteurization of milk kills pathogenic bacteria.
1. Low temperature method requires 143-1/2°F. for 30 minutes.
2. High temperature method requires 160°F. for 15 seconds.

II Three steps in milk control

A. Farm inspection
1. Cows should be tested.
2. Proper equipment must be provided.
a. Protected water supply
b. Fly proof toilet
c. Proper milk house
d. Proper barn
e. Proper utensils
3. Proper methods in the production of milk
a. Brushing and cleaning cows
b. Cleaning the barn
c. Cleaning and sterilization of utensils
d. Cooling facilities
4. Transportation to the plant
5. This part of milk control done by group known as "Farm Inspectors"

B. Plant inspection
1. Milk must be processed correctly to have a quality product.
2. Requirements of a plant building
a. Processes must be divided
b. Floors and walls smooth, easily cleaned
c. Proper drainage
d. All openings properly screened
3. Plant must have sufficient equipment.
a. Three compartment vat for washing and sterilizing bottles or mechanical bottle washer
b. A pasteurizer of approved design
c. Cooler
d. Bottle filler
e. Cold storage room
4. Good housekeeping is necessary
a. Milk should not be exposed from the time it enters the plant until it leaves in the bottle
5. Types of pasteurizers
a. Manually operated - consists of a jacketed vat using steam or hot water for pasteurizing and cold water for cooling
b. Automatically controlled
1. High temperature pasteurizers
2. Mortensen Automatic pasteurizers

C. Administrative and Laboratory Control
   1. Bacterial counts
   2. Tests for pasteurization, adulteration, etc.
   3. Penalties - degrading, fines, etc.

III Milk control in war time.

A. Vulnerable places in chain of milk handlers
   1. Farmers
   2. Protection of plant property
   3. Checking of employees - no visitors
   4. No returns to plant from stores
   5. Emergency pasteurizing equipment
   6. Consumer should boil milk before using

Emergency Housing and Shelter — Session No. 10

Environmental sanitation of housing.
- Points to be desired in housing.
  - Fresh air and sunshine
  - Cleanliness and dryness
  - Sanitary isolation
- Good housing encourages
  - Higher standards of living
  - Better personal hygiene
  - Improved environmental sanitation
- Housing factors concerned in spread of disease.
  - Ventilation
  - Crowding
  - Heating
  - Lighting - as it affects morale and sanitary conditions
  - Screening
  - Plumbing
- Housing best controlled by:
  - Proper planning
  - Sufficient and adequate inspection to find and correct defects.

Emergency housing and shelter may be necessitated by:
- Fires
- Floods
- Air raids

Provision must be made to supply homeless groups of people with:
- Safe water
- Wholesome food
- Waste disposal
- Means for maintaining personal cleanliness
- Shelter from the weather

Factors to be considered under water supply
- Source - municipal if possible. Sterilize if necessary.
- Water should be conveniently near
- Supply should be plentiful enough for fire supply
- Each person should be allotted 5 - 20 gallons water per day

Factors to be considered under food supply
- Availability of food
- Means for storing food
- Proper facilities and personnel for preparation and serving of food
- Proper garbage disposal

Factors to be considered under waste disposal
- Toilets
  - Type and location
  - Number required
    - Each sex to have separate toilet
    - 1 toilet for each 15 persons desired - never less than 1 for 20.
  - Illumination and identification
  - Cleaning
  - Waste containers
- Disposal of kitchen waste, bath and laundry water

Factors to be considered under maintaining personal cleanliness
- Baths - shower - 1 for every 20, never less than 1 for 30;
  - tub - 1 for every 50 in addition to showers.
  - Cleaning and lighting
- Hand washing facilities
  - Location

Hand washing facilities (continued)
Number - 1 for every 15 - 20
Laundry facilities

Factors to be considered under living quarters
Utilizing available buildings
Tent camps
Existing summer camps - C.C.C. camps
Box cars
Sleeping quarters
Space per person. Preferably 60 square feet per bed - 50 sq. ft.minimum with good ventilation. At least 400 cu. ft. per person.
Lighting
Windows at least 10% of floor area (for troop housing 12 - 20% is required).
Ventilation
One half of each window to open
Proper screening

Choosing location of emergency housing site.

Sanitary considerations under administration of emergency housing.
Proper personal hygiene and compliance with good sanitary and social procedure of all camp inmates must be enforced and insisted upon.
Freedom from vermin and body lice
Baths as often as needed
Personal towels
No common drinking cup
Clean bed linen after each user
Submission to health and physical examination when requested
Isolation of actual and suspected cases of communicable diseases
Cooperation in maintaining sanitation and appearance of camp

Sanitation of air raid shelters
Depends greatly on duration of stay in shelter
No more people should be allowed to use shelter than it was designed for
Ventilation must be adequate for either:
Naturally ventilated shelter
Forced ventilation shelter
Gas proof or filtered air shelter
In any one of these cases, the occupants will be endangered from foul air if overcrowding exists for more than a very short time.

Toilet facilities
One seat for every 25 persons
To be cleaned regularly
To be partitioned completely to ceiling of shelter
Chemical toilets may be necessary if sewerage is not available

Safe supply of drinking water must be provided
Approved drinking fountain best
Individual paper cups
No common drinking vessel to be tolerated

Provision must be made for proper drainage of shelter.